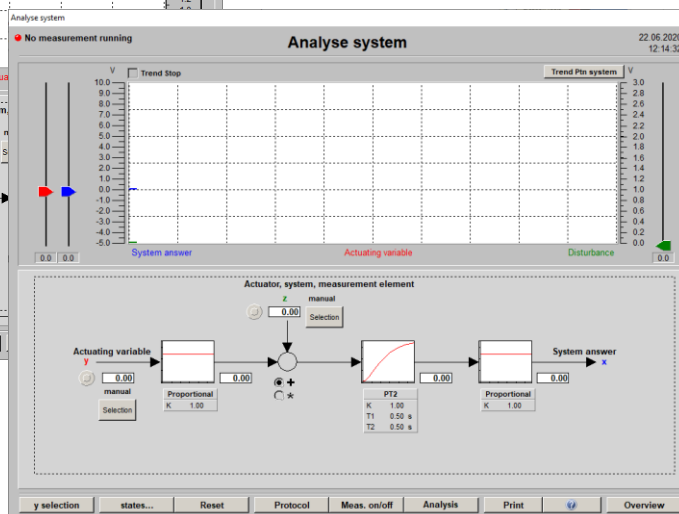
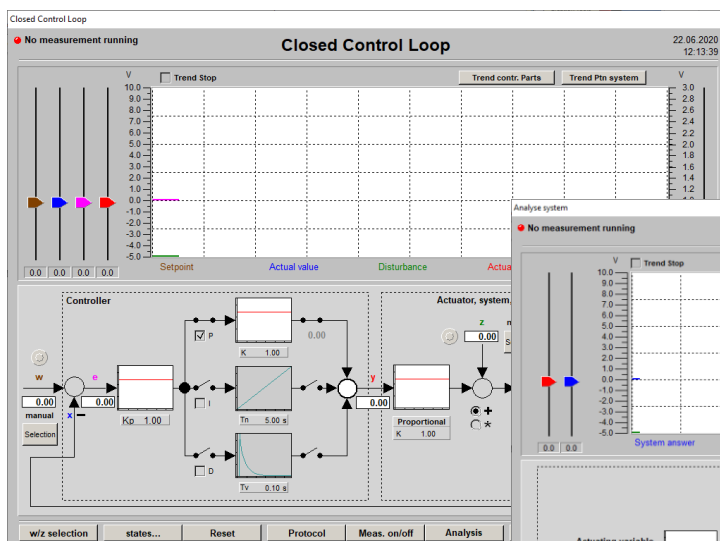


# Practical Training on Control Engineering III



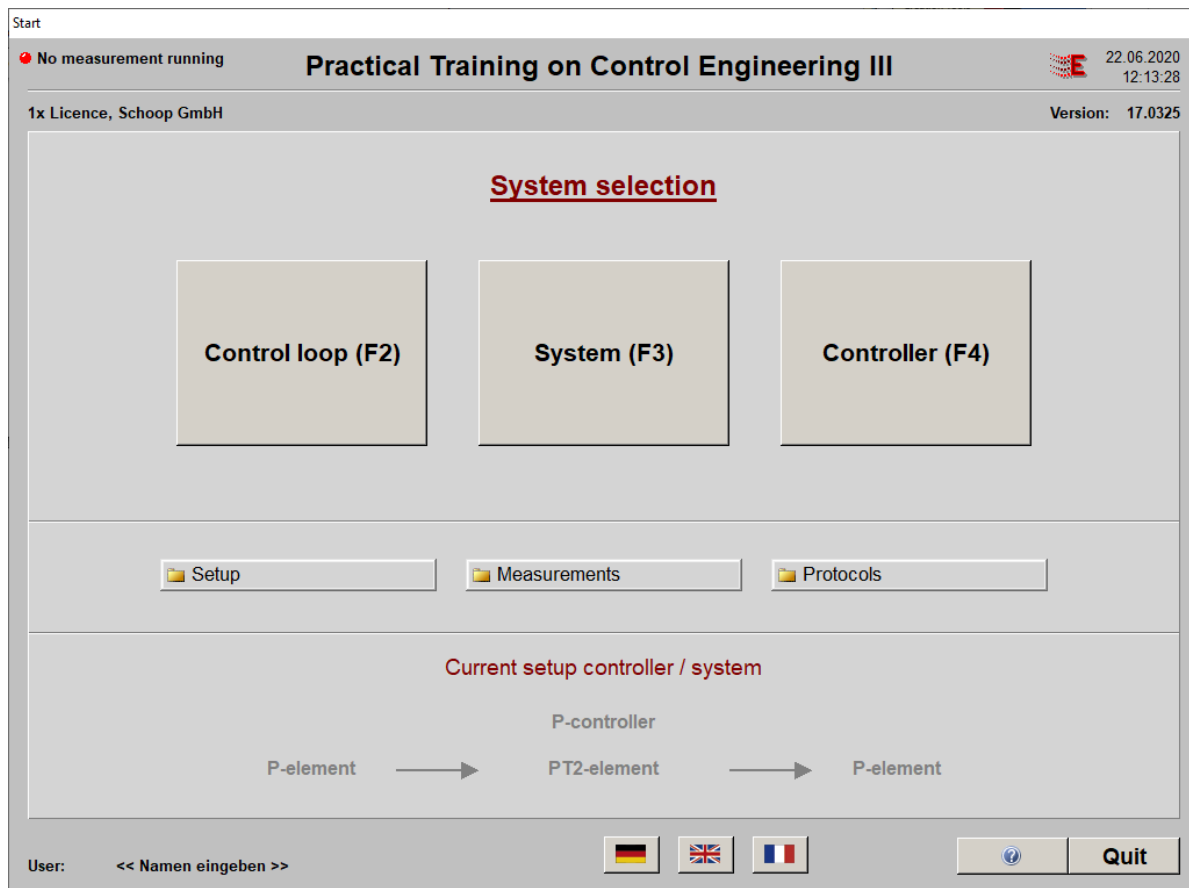
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## Overview

When starting the program you are asked to enter your name. If you choose store name the entered name will be used when starting the program again.

The name can always be changed in the footer of this page.



## Choose system

By clicking the button you are forwarded to the pages system, controller or complete closed control-loop analysis.

Below this system selection you may open three menus:

## Setup

- Printer setup.
- Load/clear state. A user defined system state (controller and system) can be loaded or cleared.
- With „reset“ all settings and parameters are set back to their initial values.
- Via „Enter name“ the according dialogue frame opens.

## Measurement Management

- Start measurement. Starts the storage of all signals,
- Stop measurement. Stops storage of signals,
- [Display measurement](#). All stored signals can be selected and displayed,
- [Compare measurements](#). Select two measurements and compare the signal path,
- Delete measurements

## Protocol Management

- Generate protocols. Three protocols are automatically generated which store the latest system, controller and according parameters as well as the measurements of the latest five minutes.
- [Display protocols](#). A dialogue window opens for the selection of a protocol
- Delete protocol.

In the lower part of the page the compiled control-loop is displayed.

With „quit“ the program is closed.

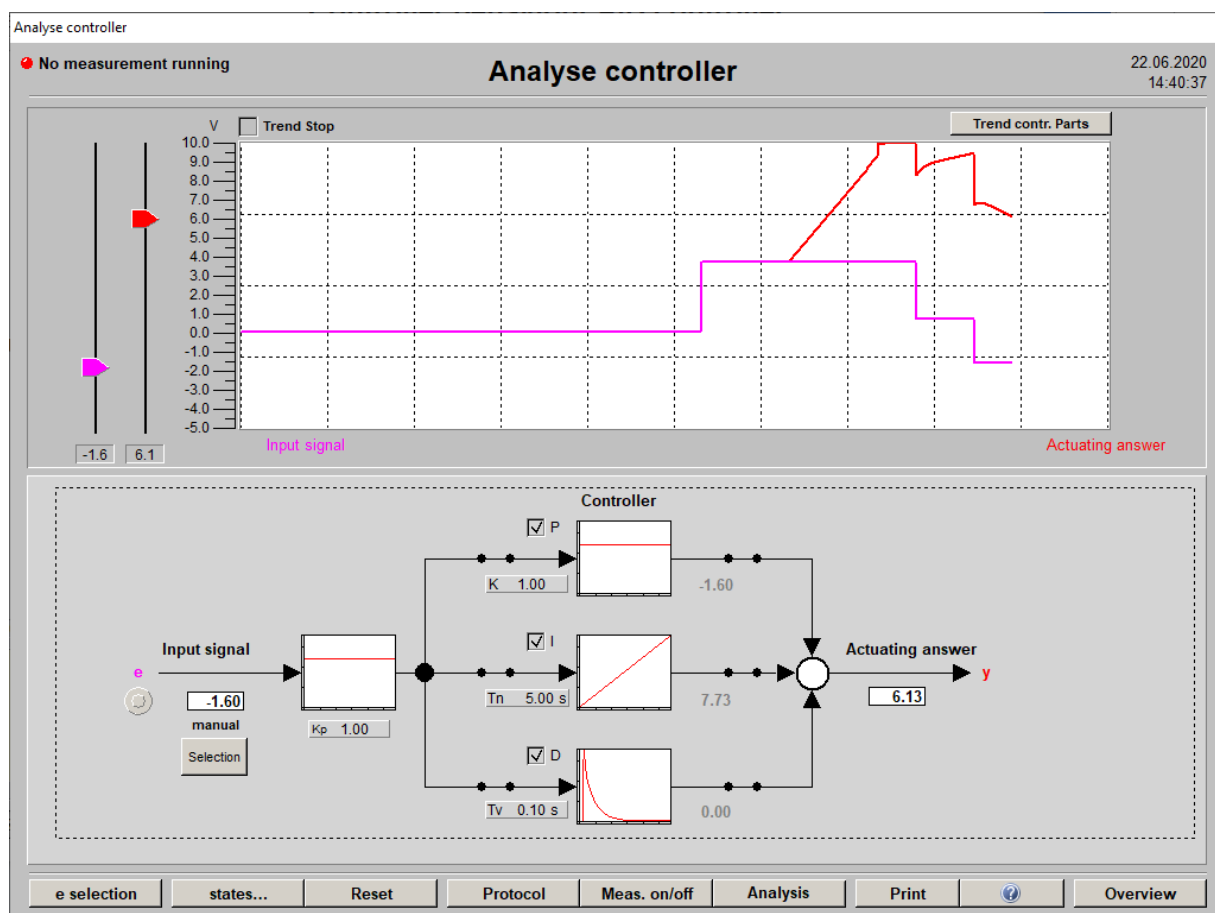
## System selection

Here a system and a controller can be selected, freely configured and put together as a control loop.

## Analyse Controller (F4)

In the head line you can see the measurement status ("No measurement running" or "Measurement No. X running.").

On this site the time response of different controllers can be analysed. The controller has an upstream gain  $K_p$ . It is compiled of three part connected in parallel (K, proportional/gain; Ti, integrator part/reset time; Td, differential part/derivative time). The parts can be put together arbitrary combination.



Clicking the symbol of the D-part opens a dialogue in which you can choose between DT1 (standard) and digital D-part.

By clicking the check boxes of the controller parts you may choose an arbitrary combination. The controller parameters are set right beside the controller parts.

Enter the input signal manually or use the start button for a previously selected function. In the upper half is a slide control and a second input window for the input signal. All changes can be viewed in the trend view. Via trend stop the online trend is stopped.

With the function keys F2 and F3 you switch to the sites “control loop” or “analyse system”. A dialogue for the selection of a function for the input signal is opened via “e selection” in the footer or via “selection”.

Following input signal functions are possible:

**1. Manual**

The value of input signal step is set manually.

**2. Jump**

Choose a jump height between -10 to 10V. By clicking the button below e („start“) the chosen value connected through, clicking again sets the input signal to 0.

**3. Sine**

A sine wave with the parameters amplitude and period is applied to controller input

**4. Triangle**

A triangle wave with the parameters gradient and amplitude is applied to controller input

**5. Rectangle**

A rectangle wave with parameters amplitude and period is applied to controller input

**6. Impulse**

An impulse is applied to controller input

Click „Start“ (button below e) and the chosen function is applied to the system.

"States" (F6) opens the page „load and save states“ With „save states“ all parameter and controller values are stored. With “load states” the stored values can be reloaded.

"Reset" (F7) sets initial conditions of the controller, whereas the chosen controller and its parameters aren't changed. If you'd like to do a full reset, switch to the overview page and perform a full reset here.

With the button “Protocol” (F8) you can create a protocol, which will open automatically.

The created protocol displays the latest parameter and structure settings. Also the signal paths of the latest five minutes are displayed, whereas the mean of five values is used.

With “Print” the current screen is printed.

“Meas. On/off” starts a new measurement or stops the running measurement. Choose “Analysis” (F10) while a measurement is running to evaluate the signal paths.

The question mark opens the manual.

Return to the main page with “Overview” (F12).

**Note:**

- The controller blocks are limited from -10.00 to 10.00 V.
- A red signal lamp displays, if the range is exceeded.

## Analysis

When opening this page the input and control signal are displayed in the current measurement. With “back” you can return to “Controller analysis”.

Following settings are possible for the measurement window:

- Change time frame numerically
- Change display frame numerically
- Choose time frame by click and drag
- Reset time frame
- Show ruler
- Statistical analysis
- Export displayed values to text file
- Print active window
- Open help

## Analyse System (F3)

Analyse the time response of the control system. Put together the system freely. Click on single blocks to choose transmission and to enter parameters. All parameters are as well displayed in the main page where you can enter them directly.

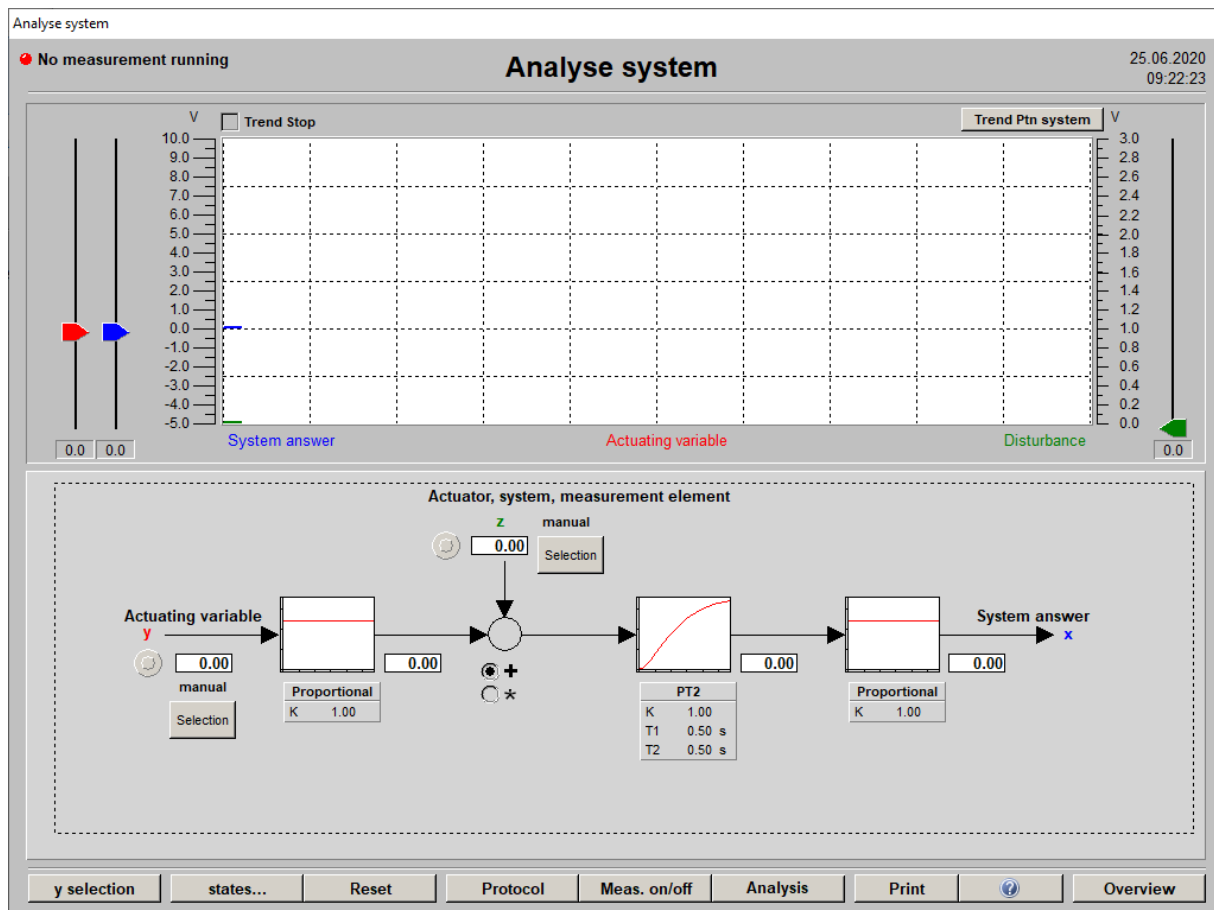
Enter the control signal step manually or choose a function and click the button below y (“Start”). In the upper half is a slide control and a second input window for the input signal. All changes can be viewed in the trend view. Via trend stop the online trend is stopped.

With the function keys F2 and F4 you switch to the sites “control loop” or “analyse controller”. A dialogue for the selection of a function for the input signal is opened via “y selection” (F5) in the footer or via “selection”.

In the head line you can see the measurement status (“No measurement running” or “Measurement No. X running.”).

Following input signal functions are possible:

- 1. Manual**  
The value of input signal step is set manually.
- 2. Jump**  
Choose a jump height between -10 to 10V. By clicking „start“ the chosen value connected through, clicking again sets the input signal to 0.
- 3. Sine**  
A sine wave with the parameters amplitude and period is applied to controller input
- 4. Triangle**  
A triangle wave with the parameters gradient and amplitude is applied to controller input
- 5. Rectangle**  
A rectangle wave with parameters amplitude and period is applied to controller input
- 6. Impulse**  
An impulse is applied to controller input



Click „Start“ and the chosen function is applied to the system.

"States" (F6) opens the page „load and save states“ With „save states“ all parameter and controller values are stored. With „load states“ the stored values can be reloaded.

"Reset" (F7) sets initial conditions of the system, whereas the chosen system and it's parameters aren't changed. If you'd like to do a full reset, switch to the overview page and perform a full reset here.

With the button "Protocol" (F8) you can create a protocol, which will open automatically.

The created protocol displays the latest parameter and structure settings. Also the signal paths of the latest five minutes are displayed, whereas the mean of five values is used.

With "Print" the current screen is printed.

"Meas. On/off" starts a new measurement or stops the running measurement. Choose "Analysis" (F10) while a measurement is running to evaluate the signal paths.

The question mark opens the manual.

Return to the main page with "Overview" (F12).



**Note:**

- The controller blocks are limited from -10.00 to 10.00 V.
- A red signal lamp displays, if the range is exceeded.
- A Ptn- system is built from Pt1-systems.

## Analysis

When opening this page the control signal and the system response are displayed in the current measurement. With “back” you can return to “Controller analysis”.

Following settings are possible for the measurement window:

- Change time frame numerically
- Change display frame numerically
- Choose time frame by click and drag
- Reset time frame
- Show ruler
- Statistical analysis
- Export displayed values to text file
- Print active window
- Open help

## Control-Loop (F2)

In the head line you can see the measurement status (“No measurement running” or “Measurement No. X running.”).

Analyse the closed control-loop. Compose a controller of the single controller parts proportional, integral and differential. You can switch on or off all parts and you can change all parameters freely. Clicking the symbol of the D-part opens a dialogue in which you can choose between DT1 (standard) and digital D-part.

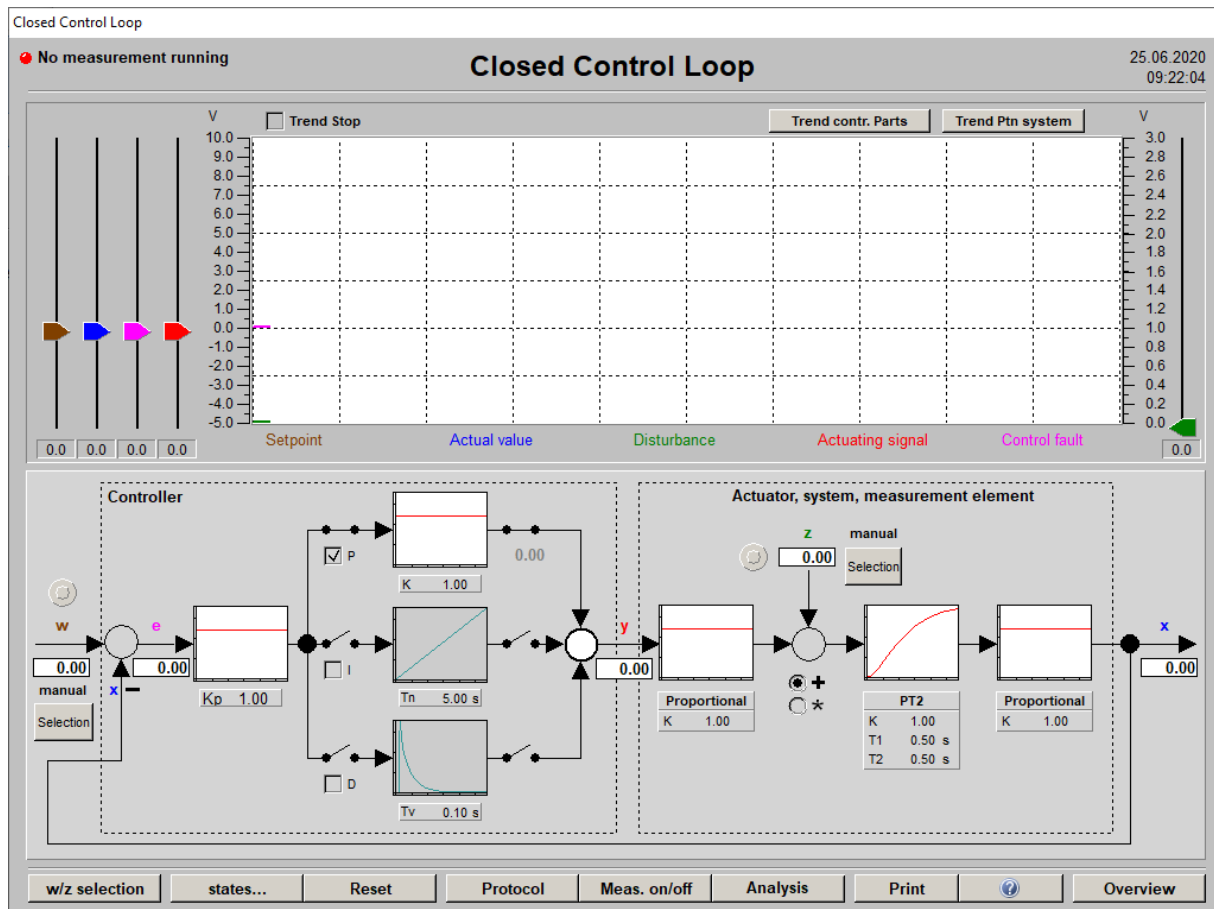
The output of the controller is set to 0-10V by default. You can adjust the output range by clicking on the summation symbol inside the controller.

By clicking the check boxes of the controller parts you may choose an arbitrary combination. The controller parameters are set right beside the controller parts.

Enter the setpoint signal and the disturbance manually or use the start button for a previously selected function using “Selection”. Click the button above setpoint or next to disturbance and the chosen function is started. All changes can be viewed in the trend view. Via trend stop the online trend is stopped.

To change the system click on a single block in the area “actuator, system, measuring unit”. The parameters can be entered right below the blocks.

A dialogue for the selection of a function for the input signal or disturbance is opened via “w-/z-selection” in the footer or via “selection”.



Following input signal functions are possible:

1. **Manual**  
The value of input signal step is set manually.
2. **Jump**  
Choose a jump height between -10 to 10V. By clicking „start“ the chosen value connected through, clicking again sets the input signal to 0.
3. **Sine**  
A sine wave with the parameters amplitude and period is applied to controller input
4. **Triangle**  
A triangle wave with the parameters gradient and amplitude is applied to controller input
5. **Rectangle**  
A rectangle wave with parameters amplitude and period is applied to controller input
6. **Impulse**  
An impulse is applied to controller input

Click the button above w or beside z („Start“) and the chosen function is applied to the system.

With the function keys F3 and F4 you switch to the sites “analyse system” or “analyse controller”.

"States" (F6) opens the page „load and save states“ With „save states“ all parameter and controller values are stored. With “load states” the stored values can be reloaded.

"Reset" (F7) sets initial conditions of controller and system, whereas the chosen controller and system and it's parameters as well as input signal and disturbance function aren't changed. If you'd like to do a full reset, switch to the overview page and perform a full reset here.

With the button “Protocol” (F8) you can create a protocol, which will open automatically. The created protocol displays the latest parameter and structure settings. Also the signal paths of the latest five minutes are displayed, whereas the mean of five values is used.

With “Print” the current screen is printed.

“Meas. On/off” (F9) starts a new measurement or stops the running measurement. Choose “Analysis” (F10) while a measurement is running to evaluate the signal paths.

The question mark opens the manual.

Return to the main page with “Overview” (F12).

**Note:**

- The controller blocks are limited from -10.00 to 10.00 V.
- A red signal lamp displays, if the range is exceeded.
- A Ptn- system is built from Pt1-systems.

## Analysis

When opening this page the control signal and the system response are displayed in the current measurement. With “back” you can return to “Controller analysis”.

Following settings are possible for the measurement window:

- Change time frame numerically
- Change display frame numerically
- Choose time frame by click and drag
- Reset time frame
- Show ruler
- Statistical analysis
- Export displayed vales to text file
- Print active window
- Open help

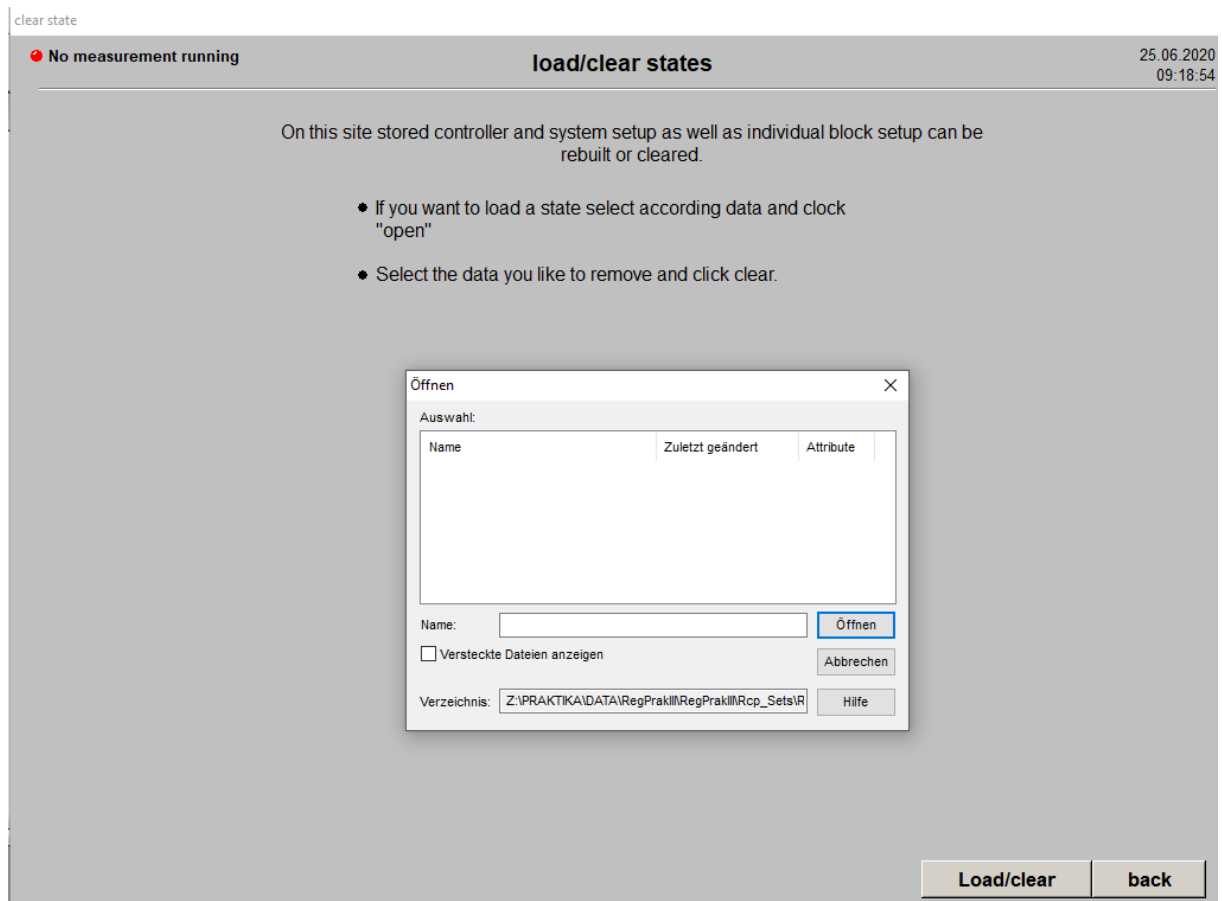
## Setup

### Load/Clear States

If you'd like to load a previously saved state mark the according data and click "open".

Mark the state you'd like to clear and use the „delete“ button of your keyboard.

With "Back" you return to the overview.



## Display Measurements

When opening this site the standard dialogue for opening a measurement opens automatically. Choose a measurement number and a signal group and click "OK".

If you'd like to see another measurement click "other measurement".

Following settings are possible for the measurement window:

- Change time frame numerically
- Change display frame numerically
- Choose time frame by click and drag
- Reset time frame

- Show ruler
- Statistical analysis
- Export displayed vales to text file
- Print active window
- Open help

## Display Protocol

Click „display protocol“ for the evaluation of the protocols. A new page opens in which you can choose one of the protocols.

Following Options are possible:

- Zoom in
- Zoom out
- Export to text file
- Print protocol
- Open general help